WHAT IS CLAIMED IS:

1.   1.   A   data   communication   system   comprising   a   data

2   transmitter, a data receiver, and a network for connecting the

3   data transmitter to the data receiver, wherein said data

4   transmitter transmits data packets to the data receiver, said

5   data receiver transmits an ACK packet for informing the data

6   transmitter of the confirmation of the delivery of the received

7   data packet, and said data transmitter detects the loss of the

8   transmitted data packet based on the content of the ACK packet

9   and retransmits the data packet, which has been detected to be

10   lost, whereby error control of data packets is carried out,

11   said data transmitter comprising:

12   a counter for counting the number of round trips of data

13   packets transmitted; and

14   means for storing, for each transmitted data packet, the

15   relationship between the data packet and the counter value at

16   the time of the transmission of the data packet and, when the

17   stored counter value is two or more smaller than the current

18   counter value, judges that the data packet corresponding to the

19   stored counter value has been lost, followed by the

20   retransmission of the data packet which has been judged to be

21   lost.

1   2. The data communication system according to claim 1,

2   wherein

3   the data transmitter further comprises means for

4   incorporating, as round trip notification information, the

5   current counter value into the data packet transmitted,

6   the data receiver further comprises means for

7   incorporating, as round trip response information, the counter

8   value, contained as the round trip notification information in

9   the received data packet, into an ACK packet for the received

10   data packet, and

11   the data transmitter further comprises means for

12   increasing the counter value by one in the case where the value

13   contained as the round trip response information in the

14   received ACK packet is equal to said counter value.

3.   A data communication system comprising a data

transmitter, a data receiver, and a network for connecting the

data transmitter to the data receiver, wherein said data

transmitter transmits data packets to the data receiver, said

data receiver transmits an ACK packet for informing the data

transmitter of the confirmation of the delivery of the received

7   data packet, and said data transmitter detects the loss of the

8   transmitted data packet based on the content of the ACK packet

9   and retransmits the data packet, which has been detected to be

10   lost, whereby error control of data packets is carried out,

11   said data transmitter comprising:

12   a counter for counting the number of round trips of data

13   packets transmitted;

14   first and second tables for storing predetermined data;

15   means for storing, for each transmitted data packet, the

16   relationship between the data packet and the time at the point

17   of the transmission of the data packet in the first table;

18   means for storing, in the second table, for each counter

19   value in the counter, the relationship between the counter

20   value and the time at the point of the transmission of the

21   first data packet after the counter has indicated said counter

22   value; and

23   means which, when the value of the time stored in the

24   first table is smaller than the value of the time corresponding

25   to a counter value which is two smaller than the current

26   counter value stored in the second table, judges that the data

27   packet corresponding to the time stored in the first table has

28   been lost, followed by the retransmission of the data packet

29   which has been judged to be lost.

       4. The data communication system according to claim 3,

2   wherein

3   the data transmitter further comprises means for

4   incorporating, as time notification information, the current

5   time into the data packet transmitted,

6   the data receiver further comprises means for

7   incorporating, as time response information, the time,

8   contained as the time notification information in the received

9   data packet, into an ACK packet for the received data packet,

10   and

11   the data transmitter further comprises means for

12   increasing the counter value by one in the case where the time

13   contained as the time response information in the received ACK

14   packet is equal to or larger than the current time value stored,

15   in the second table, in the relationship with the current

16   counter value.

1   5. A data communication system comprising a data

2   transmitter, a data receiver, and a network for connecting the

3   data transmitter to the data receiver, wherein said data

4   transmitter transmits data packets to the data receiver, said

5   data receiver transmits an ACK packet for informing the data

6   transmitter of the confirmation of the delivery of the received

7   data packet, and said data transmitter detects the loss of the

8   transmitted data packet based on the content of the ACK packet

9   and retransmits the data packet, which has been detected to be

10   lost, whereby error control of data packets is carried out and,

11   wherein, during error control in its period between the

12   detection of the loss of a data packet and the confirmation of

13   the delivery of the data packet by the data transmitter,

14   transmission flow control is carried out by a transmission

15   window,

16   said data transmitter functioning to release, from the

17   transmission window, a closed window to an extent corresponding

18   to the total size of data, for which delivery confirmation has

19   been newly made by ACK packets received from the data receiver

20   during the error control, thereby rendering the released window

21   transmittable.

1   6. A data communication method comprising the steps of:

2   providing a data communication system comprising a data

3   transmitter, a data receiver, and a network for connecting the

4   data transmitter to the data receiver; transmitting data

5   packets   by   the   data   transmitter   to   the   data   receiver;

6   transmitting an ACK packet for informing, by the data receiver,

7   the data transmitter of the confirmation of the delivery of the

8   received data packet; detecting the loss of the transmitted

9   data packet, by the data transmitter, based on the content of

10 the ACK packet; and retransmitting the data packet, which has

11 been detected to be lost, by the data transmitter, thereby

12 performing error control of data packets, wherein

13   the data transmitter is provided with a counter for

14 counting the number of round trips of data packets transmitted,

15 and

16   for each transmitted data packet, the relationship

17 between the data packet and the counter value at the point of

18 the transmission of the data packet is stored, and, when the

19 stored counter value is two or more smaller than the current

20 counter value at that time, the data packet corresponding to

21 the stored counter value is regarded as having been lost,

22 followed by the retransmission of the lost data packet.

1   7. The data communication method according to claim 6,

2   wherein

3   the data transmitter incorporates, as round trip

4   notification information, the current counter value into the

5   data packet transmitted,

6   the data receiver incorporates, as round trip response

7   information, the counter value, contained as the round trip

8   notification information in the received data packet, into an

9   ACK packet for the received data packet, and

10   the data transmitter increases the counter value by one

11   in the case where the value contained as the round trip

12   response information in the received ACK packet is equal to

13   said counter value.

1   8. A data communication method comprising the steps of:

2   providing a data communication system comprising a data

3   transmitter, a data receiver, and a network for connecting the

4   data transmitter to the data receiver; transmitting data

5   packets by the data transmitter to the data receiver;

6   transmitting, by the data receiver, an ACK packet for informing

7   the data transmitter of the confirmation of the delivery of the

8   received data packet; detecting the loss of the transmitted

9   data packet, by the data transmitter, based on the content of

10   the ACK packet; and retransmitting the data packet, which has

11   been detected to be lost, by the data transmitter, thereby

12   performing error control of data packets, wherein

13   the data transmitter is provided with a counter for

14   counting the number of round trips of data packets transmitted,

15   and first and second tables for storing predetermined data,

16   for each transmitted data packet, the relationship between the

17   data packet and the time at the point of the transmission of

18   the data packet is stored in the first table,

19   for each counter value in the counter, the relationship

20   between the counter value and the time at the point of the

21   transmission of the first data packet after the counter has

22   indicated said counter value is stored in the second table, and

23   when the value of the time stored in the first table is

24 smaller than the value of the time corresponding to a counter

25 value which is two smaller than the current counter value

26 stored in the second table, the data packet corresponding to

27 the time stored in the first table is regarded as having been

28 lost, followed by the retransmission of the data packet which

29 has been judged to be lost.

1   9. The data communication method according to claim 8,

2 wherein

3   the data transmitter incorporates, as time notification

4 information, the time at that point into the data packet

5 transmitted,

6   the data receiver incorporates, as time response

7 information, the time, contained as the time notification

8 information in the received data packet, into an ACK packet for

9 the received data packet, and

10   the data transmitter increases the counter value by one

11 in the case where the time contained as the time response

12 information in the received ACK packet is equal to or larger

13 than the time stored in the relationship with the current

14 counter value stored in the second table.

1   10. A data communication method comprising the steps of:

2 providing a data communication system comprising a data

3 transmitter, a data receiver, and a network for connecting the

4 data transmitter to the data receiver; transmitting data

5 packets by the data transmitter to the data receiver;

6 transmitting, by the data receiver, an ACK packet for informing

7   the data transmitter of the confirmation of the delivery of the

8   received data packet; detecting the loss of the transmitted

9   data packet, by the data transmitter, based on the content of

10   the ACK packet; retransmitting the data packet, which has been

11   detected to be lost, by the data transmitter, thereby

12   performing error control of data packets; and performing

13   transmission flow control by a transmission window, during

14   error control in its period between the detection of the loss

15   of a data packet and the confirmation of the delivery of the

16   data packet by the data transmitter, wherein

17   the data transmitter functions to release, from the

18   transmission window, a closed window to an extent corresponding

19   to the total size of data, for which delivery confirmation has

20   been newly made by ACK packets received from the data receiver

21   during the error control, and consequently renders the released

22   window transmittable.

1   11. A computer readable recording medium comprising,

2   recorded thereon, a program which is used in executing the data

3   communication method according to any one of claims 6 to 10 by

4   means of a computer.